

## EARTHWORKS AND INFRASTRUCTURE REPORT

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<b>Project Name:</b>	Orawaahi – A Complete Community Project ('the Project')
<b>Client:</b>	Knight Investments Ltd
<b>CP Project No:</b>	2296-01
<b>CP Document No:</b>	2296-01-ER02-earthworksandinfrastructure-aja-rfs-20251030
<b>Date of Issue:</b>	29 October 2025
<b>Originator:</b>	Anthea Abbott – Senior Civil Engineer
<b>Reviewer:</b>	Ryan Pitkethley – Director

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### 1. Introduction & Project Description

This report has been prepared in relation to a fast-track referral application by Knight Investments for the proposed *Orawaahi - A Complete Community Project* ('the Project').

The Project Area is legally described as Lot 3 DP 337204 and Lot 1 DP 337204, known as 156 Clarks Beach Road and the adjacent lot which has no street address.

In addition, works are proposed on:

1. 115 Clarks Beach Road (Lot 1020 DP 578599, Lot 1012 DP 573987, Lot 1018 DP 573987, Lot 1001 DP 560664, Lot 1003 DP 560664, Lot 801 DP 526153, Lot 200 DP 567326, 9/14 SH Lot 300 DP 526153, 4/23 SH Lot 100 DP 560664), for works associated with required infrastructure/roading upgrades.
2. Lot 4 DP 116708 held as Local Purpose Reserve (Esplanade), located at the southern edge of the site, adjacent to the Coastal Marine Area ("CMA").
3. A portion of land which is vested as legal road, as per GeoMaps (but unformed), which is located between the subject site and the CMA.
4. Clarks Beach Road.

The Project may include:

1. Water supply and infrastructure works on Lot 11 DP 492623 which has no street address and on Lot 7 DP492607 (50 Sydney Owen Road),

2. Works on Clarks Beach Road, McKenzie Road, Waiiau Pa Road and Sydney Owen Road for works associated with required infrastructure.

The Project is a masterplanned sustainable extension to the existing Clarks Beach coastal community that enables multigenerational living, local employment and community services. The Project will be integrated with the fast growing Clarks Beach community, and will provide a logical extension to it.

The Project seeks to establish:

1. Residential lots to accommodate approximately 700-800 dwellings;
2. A retirement village of approximately 220 units/villas;
3. A neighbourhood centre (likely to include supermarket, retail, a community hub, commercial offices, food and beverage premises, childcare and/or fitness/wellness facilities)
4. A service / light industrial area (likely to include workshops, storage and warehouse facilities, associated retail and business premises);
5. A multi-functional green / blue network across the site's stream and wetland features, with enhancements of the coastal edge. This will include neighbourhood parks, recreational walkways, and pedestrian/cycle connections throughout the site.

This report outlines the engineering works required including earthworks and available options for provision of water and wastewater services for the Project.

## 2. Earthworks

### 2.1 General Description

Bulk earthworks will be required across a large portion of the application site to establish finished surface levels suitable for the Project. The final earthworks volumes will be designed to balance the respective cut and fill volumes within the site as much as possible and will be confirmed as part of the substantive application.

The bulk earthworks will likely be required to support the formation of roads, shared JOALs, lots, and stormwater devices.

### 2.2 Sediment and Erosion Control

Erosion and sediment control measures will be confirmed as part of the substantive application and implemented throughout the duration of the site works. Due to the site's proximity to sensitive receiving environments, chosen methods will reflect the need to maintain a high standard of erosion and sediment control across the site. All measures will comply with the *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05)*.

1. Proposed measures may include a combination of the following devices:
2. Stabilised construction entrances
3. Sediment retention ponds
4. Decanting earth bunds
5. Rapid stabilisation of exposed areas
6. Silt fences
7. Clean and dirty water diversions

### 2.3 Methodology

The methodology for the bulk earthworks will be confirmed as part of the substantive application however a typical methodology may include the following steps:

1. Installation of clean water diversions to prevent water ingress into the work area.
2. Construction of silt fences.
3. Establishment of stabilised site entrances and exits.
4. Installation of all chosen erosion and sediment control devices.
5. As-built certification of erosion and sediment control devices, followed by Council inspection.
6. Bulk excavation to subgrade level and commencement of fill operations.
7. Installation of drainage infrastructure and reuse of suitable spoil as engineered fill.

8. Construction of roads, accessways, and hardstand areas.
9. Stabilisation of exposed surfaces using grassing, mulching, or other approved methods.
10. Decommissioning of erosion and sediment controls once the site is stabilised and approved by Council.

Monitoring of the devices will be undertaken throughout the earthworks activity.

All bulk earthworks will be undertaken in accordance with NZS 4431: Code of Practice for Earth Fill for Residential Development and monitored by a suitably qualified geotechnical professional.

### 3. Wastewater

There is no existing public wastewater reticulation servicing the site.

The adjacent Clarks Beach Precinct area is serviced with gravity reticulation and wastewater pump stations to the Clarks Beach Wastewater Treatment Plant (WWTP) located within the golf course, off Stella Drive.

#### 3.1 Demand Flow Calculations

Using the parameters included within the Auckland Council Code of Practice for Wastewater, the Project will create a wastewater demand of 8.6l/s or 744m<sup>3</sup>/day (if using a traditional “gravity based” system). Detailed calculations have been provided in Appendix 1, and shown below in Table 1.

**Table 1: Expected Wastewater Flows**

	Description	Expected Flow
Residential Dwellings	700-800 Dwellings, 180l/p/day, 3 persons/dwelling	378-432m <sup>3</sup> /day
Retirement Village	222 units, 180l/p/day, 1.5 persons/dwelling	120m <sup>3</sup> /day
Neighbourhood Centre	6012m <sup>2</sup> GFA Mixed use - 1/3 Dry Retail, 2/3 Wet Retail 15l/m <sup>2</sup> /day for 4012m <sup>2</sup> 1.3l/m <sup>2</sup> /day for 2000m <sup>2</sup>	63m <sup>3</sup> /day
Light Industrial	25019m <sup>2</sup> GFA, 4.5l/m <sup>2</sup> /day	113m <sup>3</sup> /day
<b>Total ADWF (Average Dry Weather Flows)</b>		<b>674-728m<sup>3</sup>/day</b>
<b>Total PDWF (Peak Dry Weather Flows)</b>		<b>2180-2344m<sup>3</sup>/day</b>
<b>Peaking Factor for Gravity Sewer</b>		<b>6.7</b>
<b>Total PWWF (Gravity) (Peak Wet Weather Flows)</b>		<b>4506-4868m<sup>3</sup>/day</b>
<b>Peaking Factor for Pressure Sewer (LPS)</b>		<b>1.2<sup>1</sup></b>
<b>Total PWWF (LPS) (Peak Wet Weather Flows)</b>		<b>808-873m<sup>3</sup>/day</b>

<sup>1</sup> A lower peaking factor of 1.2 is recommended for low pressure systems as they are not susceptible to inflow and infiltration like gravity systems and are also designed with more predictable and manageable flow patterns, allowing for lower peaking factors.

## 3.2 Orawaahi Wastewater Servicing

The Project can be serviced for wastewater infrastructure by either of the following methods:

6. Option 1: An onsite wastewater treatment plant solution such as a Membrane Bio Reactor (MBR) WWTP (with local discharge)
7. Option 2: Connection to the Water Services Limited ("WSL") network.

These options are indicatively shown on Appendix 2.

We also note that a hybrid solution comprising components of each option may also be feasible (e.g treatment onsite but discharge to the WSL discharge location etc).

### 3.2.1 Option 1: On Site MBR Treatment

An onsite solution for wastewater treatment can be provided.

This option involves deploying a modular, containerised treatment plant that can be sized according to the staging requirements of the development.

The main features and benefits include scalable capacity allowing for incremental expansion as the development progresses, shorter installation timeframes, supporting rapid response to development needs.

The plants will be customised for the required flows and may include membrane bioreactors (MBR) and/or membrane aerated biofilm reactors (MABR). It is likely that an MBR or MABR/MBR hybrid (with nutrient removal and disinfection) will be required for the Project.

While the contaminant concentrations from the residential component of the Project are expected to be in line with standard domestic strength wastewater, the commercial components will have a waste strength of approximately three times that of the domestic sources. The key parameters for raw influent contaminant concentrations are likely to be:

- Carbonaceous Biochemical Oxygen Demand (cBOD<sub>5</sub>)
- Total Suspended Solids (TSS)
- Total Nitrogen (TN)
- Total Phosphorus (TP)

#### Treated Wastewater Quality

In our experience, the MBR WWTP solutions provide for best practice treatment, and the expected effluent quality far exceeds the standard quality of discharges from standard wastewater treatment systems within New Zealand. For example, WSL operates with the current discharge quality limits identified in Table 1 whereas Table 2 identifies recent private WWTP's which have been approved with MBR technology:

**Table 1: WSL WWTP Discharge Quality**

WWTP	BOD	TSS	NH	TN	RP3	TP	FC
Pukekohe WWTP	<12	<18	<10	-	-	<8	<1,000 CFU/100 mL
Mangere WWTP	<15	<15	<3 <5	35	<9	-	>99% disinfection
Clarks Beach WWTP	<5	<5	<2	<5	-	-	-

**Table 2: Private WWTP Discharge Quality**

WWTP	BOD	TSS	NH	TN	RP3	TP	FC
Kingseat	<2	<5	<2	<2	-	0.5	<5 CFU/100 mL
Karaka North	5	4	2	5		2	2 CFU/100 mL

The quality of treated wastewater discharge is typically determined by the characteristics of the receiving environment. However, it will also be derived from the potential effects on a number of different elements, including overall water quality, ecology and cultural values. This will be determined as part of the substantive application which will include a comprehensive Assessment of Environmental Effects (AEE.)

### Polishing Wetland/Land Contact Device and Discharge to Surface Water

Following treatment, the wastewater can be further treated using a polishing wetland or land contact device that will meet the cultural requirements of local Iwi.

A combination of vertical and horizontal flow wetlands will provide a habitat for flora and fauna, provide a high level of amenity value for the development prior to the discharge of water to freshwater (via a permanent stream/inland tributary).

### Water re-use onsite

Wastewater re-use can reduce the overall demand for water from traditional water sources (e.g. groundwater) and provides a reliable source of non-potable water during drier periods. This contributes to the overall environmental sustainability of the development.

Although the MBR typically reduces bacteria concentrations in the wastewater down to undetectable levels, a UV reactor, which uses ultra-violet radiation to kill more than 99.9% of remaining bacteria and viruses in the treated water, and dosing of residual chlorine into the treated water prior to reuse, can also be used to further ensure the safety of recycled water.

As a minimum, the WWTP will produce treated wastewater equivalent to "Grade A" recycled water suitable for dual reticulation for domestic garden use and unrestricted municipal irrigation.

MBBR/MBR treated wastewater can potentially be utilised for the following:

- Recycling of residual nutrients and watering of natives/plants within the development or specifically for nursery watering.
- Washdown water e.g. for boat cleaning.
- Other non-potable uses such as toilet flushing.

Overall, the re-use of wastewater within the development is feasible and represents a viable treated wastewater reuse option.

### **Assessment of Effects**

The total wastewater generated has been estimated at 717 m<sup>3</sup>/d. This volume is approximately 0.2% of the average daily flow of the freshwater tributary. Where the discharge would enter any freshwater tributary prior to entry into the CMA the existing water quality would also be assessed (via sampling across several months) to determine the required quality of treatment to be applied to any discharge to ensure that the existing freshwater quality is not impacted.

Using the wastewater treatment technologies that are readily available and well proven, the wastewater can be treated to a level that will have very little impact on the Taihiki River and any tributary where the direct discharge occurs.

However, viruses are often as much an issue as bacteria and can be much more difficult to kill, remove, or disinfect. Modern pathogen reduction techniques, such as ultraviolet treatment, membrane filtration, and ultra filtration are capable of reducing all pathogens to near undetectable levels. The ultimate level of disinfection required will be appropriately defined during design for the substantive application

The cumulative stormwater and wastewater flows will be calculated and assessed to determine whether any scour and erosion protection is required at the Coastal Marine Area outlet. As covered in the Stormwater Assessment Report during the substantive design phase, ecological and geological assessment of the streams will be undertaken to determine whether attenuation of the increased peak flows and velocities will be needed to mitigate erosion impacts within the stream. As the soils in the area are cohesive and allow for minimal infiltration, and the gradient of the stream is gradual, it is likely that attenuation of the full post development flows will not be required. This will be confirmed during the substantive design phase. Should it be determined that the increased stormwater and wastewater flows will cause erosion of the stream, then attenuation can be provided via detention basins. Energy dissipation at outlets and riparian planting of the stream will be provided.

### **3.2.2 Option 2: Connection to the WSL network.**

As WSL owns and operates the adjacent public network and the CBWWTP, should WSL agree, then the Project could be connected to the WSL network.

Consultation with WSL's Strategy and Consenting team to date has not identified that this option is currently possible. However, the applicant has a commitment from WSL's Property team that WSL will endeavour to work with together on the water and wastewater requirements for the Project.

## **3.3 Wastewater reticulation**

If the site is able to be serviced via the public treatment system, the preference would be for the wastewater reticulation to be via a gravity pipe network and will likely include a pump station to transmit the wastewater from the southern end of the site to the CBWWTP.

If the site is to be serviced by a private MBR, to minimise the peak wastewater flows at the on-site treatment plant, the wastewater reticulation within the site is recommended to be a via low pressure sewer reticulation network. This system requires a pump chamber containing a grinder pump on each lot (or cluster of residential/commercial buildings). The pump chamber is connected to a pressure main which transfers wastewater to the WWTP.

## 4. Water

### 4.1 Existing Infrastructure

There is no existing public water reticulation servicing the site.

The existing settlement at Clarks Beach is supplied via a watermain which connects from the Waikato No 1 watermain at the Rutherford Road Reservoir through Pukekohe, Patumahoe, Kingseat Road. From Kingseat Road, through Sydney Owen Road, Waiiau Pa Road and Clarks Beach Road, the watermain is a 250mm PE network watermain designed to WSL's local watermain design standard. This 250mm diameter watermain runs along the road frontage of the Project.

Within Clarks Beach there is a chlorine booster pump station and underground reservoir located at Leaming Place. The capacity of the reservoir at Clarks Beach is 1,100m<sup>3</sup>.

### 4.2 Orawaahi Demand Flow Calculations

Using the parameters included within the Auckland Council Code of Practice for Water, the proposed Project will create an average water demand of 764m<sup>3</sup>/day, peak day demand of 1528m<sup>3</sup>/day and peak hour demand of 71l/hr. This equates to an average annual demand of 280,000m<sup>3</sup>/year. Refer to calculations attached to Appendix 1.

**Table 2: Water Demand Summary based on Watercare Code of Practice Demand Guidelines**

	Average Daily Demand
Neighbourhood Centre	62.8m <sup>3</sup> /day
Light Industrial	112.6m <sup>3</sup> /day
Retirement Village	73.3m <sup>3</sup> /day
Residential Dwellings	515.5m <sup>3</sup> /day
<b>Total</b>	<b>764m<sup>3</sup>/day</b>

The above demand calculations could be significantly reduced with the addition of water saving efficiency measures (i.e low flow fixtures), roof water re-use for non-potable uses and any greywater reuse for non-potable uses.

### 4.3 Orawaahi Water Servicing

The Project can be serviced for water infrastructure by either of the following methods:

1. Option 1: Private Bore/Treatment supplemented by on lot tanks.
2. Option 2: Connection to the Water Services Limited ("WSL") network.

These options are indicatively shown on Attachment 2.

We also note that a hybrid solution comprising components on each option may also be feasible (e.g connection to the WSL network but inclusion of an additional reservoir, or connection capacity for some activities (e.g retirement or neighbourhood centre)).

### 4.3.1 Option 1: Private Bore/Treatment supplemented by on lot tanks

#### Bore Supply

The Project sites is within the Waiau Pa Waitemata aquifer.

The Applicant is the owner of land (under an affiliate company) at McKenzie Road, Waiau Pa (Lot 11 DP 485009). This site holds a current resource consent (WAT60315288) to take 50,000m<sup>3</sup>/year of water from the Franklin Glenbrook Kaawa aquifer.

Based on the water demand calculations above the combined uses for the retirement village and neighbourhood centre activities the demand would be 137m<sup>3</sup> per day which is equivalent to the daily take from WAT60315288.

Thus, the Applicant could pipe the water from McKenzie Road to the Project to service part of the development.

#### Water Treatment

Water can be treated via an onsite Water Treatment Plant either at the Project site or at Lot 11 DP 485009.

On-site treatment would typically include processes such as filtration, disinfection (e.g., UV or chlorination), and possibly additional treatment steps to address site-specific concerns such as hardness, iron, or manganese.

Treated water can be stored in a dedicated reservoir, with booster pumps and a reticulation network distributing potable water to the retirement village and neighbourhood centre area. The water supply will comply with the relevant drinking water standards.

#### On lot Tanks

##### Retirement Village / Neighbourhood Centre

Water supply could be provided and/or supplemented by on lot tanks for the Retirement Village / Neighbourhood Centre (including where tanks are used for non-potable uses).

##### Light Industrial area

The water demand calculations for the light industrial area show that demand is relatively low. This is due to the limited activities that would be enabled in this area (e.g mechanic, light fabrication, storage etc).

To provide a consistent water supply for the 25,000m<sup>2</sup> industrial area a rain tank of 3,800m<sup>3</sup> would be required (40m diam by 3m deep).

We also note that the demand calculations could be significantly reduced with the addition of water saving efficiency measures (i.e low flow fixtures), roof water re-use for non-potable uses and any greywater reuse for non-potable uses.

The final demand will be more accurately calculated as part of the substantive application.

## Residential lots

The Watercare code of practice requires water demand to be calculated as 220 litres per day per person, with an average residential design occupancy of 3 people per dwelling.<sup>3</sup> This equates to a daily need of 660 litres per dwelling.

However, the Auckland council rainwater tank sizing calculator utilises 177 litres per day.<sup>4</sup>

It is not uncommon for residential houses to use water saving devices to reduce water demand. Auckland Council GD06 shows a reduction in daily demand per person of up to 60L-80L/per person/day when applying water saving fixtures to the household.

This takes the design demand from 177L/per person/day to 117-97 litres/per person/day.

Using the measurement of 117-97 litres per day per person (as water saving fixtures can be mandated through conditions on the resource consent) the below table outlines the feasibility to provide on lot rainwater tanks.

**Table 3: Residential Rainwater Tanks**

Lot size	Roof area (40% site coverage)	Average Rainfall collected 5	Demand for 3x people	Demand for 4x people	Demand for 5x people	Tanks Size
350	140	143,200 litres	106,215 - 128,115	141,620 - 170,820	177,025 - 213,525	30,000litres to 55,000litres
375	150	154,000 litres				
400	160	164,600 litres				
450	180	185,800 litres				
500	200	207,000 litres				

Suitable allowance for overflows will need to be made and tie into the stormwater management techniques for each lot.

Furthermore, it is noted that toilets and laundry water usage equate to circa 40% of daily demand per household. The applicant could require that greywater be dual plumbed back into dwellings for at least toilet flushing which would also significantly reduce the total water consumption.

## Assessment of Effects

Potential effects on the aquifer availability and drawdown effects from bore supply can be addressed at the substantive application stage. If the existing consent is to be utilised, the effects have also been evaluated and approved by the Council and no further assessment is warranted. All water that will be supplied by the bore will be suitably treated to avoid effects on human health.

On lot rainwater tanks may have the potential to reduce groundwater recharge of the aquifer. Although rainwater tanks intercept roof runoff, the proposed closed site system, where wastewater generated onsite is retained and treated within the development, means that water that would

<sup>3</sup> Watercare, The Auckland Code of Practice for Land Development and Subdivision, Water and Wastewater code of Practice for Land Development and Subdivision, 2019, Chapter 6 Water

<sup>4</sup> <https://new.aucklandcouncil.govt.nz/en/environment/looking-after-aucklands-water/rainwater-tanks/rainwater-tank-size-calculator.html>

<sup>5</sup> <https://new.aucklandcouncil.govt.nz/en/environment/looking-after-aucklands-water/rainwater-tanks/rainwater-tank-size-calculator.html>

otherwise leave the site is returned to the soil contributing to local recharge. The rainwater tank overflows will also be directed to either infiltration, if possible, or via the stormwater system to the natural wetlands within the site. As a result, the impact on groundwater recharge is anticipated to be minimal. Please refer to the Civilplan Stormwater Assessment Report.

#### **4.3.2 Option 2: Connection to the WSL network.**

As WSL owns and operates the adjacent public network, should WSL agree, then the Project could be connected to the WSL network.

Consultation with WSL's Strategy and Consenting team to date has not identified that this option is currently possible. However, the applicant has a commitment from WSL's Property team that WSL will endeavour to work with together on the water and wastewater requirements for the Project.

### **4.4 Fire Fighting**

A reticulated firefighting water supply will be provided for the development. For the Option 1, private bore water supply, the firefighting water supply shall be sourced from the bore located at Lot 11 DP 485009. A reservoir and booster pump shall be located within this development. The reservoir shall allow for firefighting water supply.

The volume of the firefighting water storage will be dependent on the final fire cell size of industrial units. For industrial fire cells of up to 399m<sup>2</sup> a firefighting water supply volume of 180m<sup>3</sup> would be required, whilst for up to 599m<sup>2</sup> industrial fire cells units a volume of 540m<sup>3</sup> would be needed. An indicative location for the combined water supply and firefighting supply reservoir and booster pump is shown on SK12-1 in Appendix 2.

The reticulated supply shall comply with the requirements of SNZ 4509 New Zealand Fire Service Firefighting Water Supplies Code of Practice. This shall include ensuring that fire hydrants are located within 135m of all building main entries, with a secondary fire hydrant located within 270m. A minimum water flow of 12.5L/s shall be provided for all residential hydrants. Industrial and commercial hydrant flows shall be in accordance with the requirements of the SNZ 4509 New Zealand Fire Service Firefighting Water Supplies Code of Practice.

## 5. Conclusion

The proposed Project at Clarks Beach Road presents significant opportunities for urban expansion, integrating retail, business, and residential zones. Notwithstanding the site's current zoning and the absence of existing infrastructure connectivity, there are feasible, and sustainable, servicing solutions available for the Project to ensure that the site can be appropriately serviced.

Wastewater servicing options include either an onsite treatment plant or connection to the WSL network. The onsite MBR solution offers scalable capacity, high effluent quality, and supports rapid development, while a WSL connection would integrate the project into the existing public network. Hybrid solutions may also be considered, combining onsite treatment with discharge to WSL infrastructure. The design will ensure compliance with best practice standards and minimize environmental impacts, including the use of water reuse and minimisation strategies.

Water servicing can be achieved via a combination of private bore supply and rainwater tanks or by connecting to the WSL network. Calculations indicate that water-saving measures, rainwater harvesting, and greywater reuse can significantly reduce overall consumption.

A reticulated firefighting water supply will be provided in accordance with SNZ 4509 SNZ 4509 New Zealand Fire Service Firefighting Water Supplies Code of Practice.

The final servicing strategy will be further developed during the substantive application phase, with further assessment of environmental effects, and consultation with relevant stakeholders, including iwi and MACA claimants.

It is the applicant's intention to continue to work with Watercare Services Ltd (WSL) to pursue an integrated public solution. However, if this is not feasible, it has been demonstrated that the project alternative solutions exist for both water and wastewater servicing.

# APPENDIX 1

## Demand Calculations



**WASTE WATER AND PIPE FLOW CALCULATOR**

**WATERCARE WASTEWATER CODE OF PRACTICE - COLEBROOK WHITE AND MANNINGS EQUATIONS**

**CLIENT:** KNIGHT INVESTMENTS LTD  
**PROJECT:** 162 Clarks Beach Road  
**OUTFALL:**

**DESIGNER:** KN  
**JOB NO:** 2296  
**DATE:** 30/05/2025  
**REV:** 1

NOTE: This spreadsheet calculates peak flow rates using the Watercare Code of Practice and pipe capacities using the Colebrook-White equation for pipes flowing full, and the Mannings equation for pipes flowing part-full  
**Green boxes are user inputs**

**Design Flow Assumptions (Section 5.3.5.1 WWCoP):**

<b>Residential</b>	Residential	High Rise Residential	
Average Dry Weather Flow (ADWF) =	180	180 l/p/d	
Peak Factor: Self-Cleansing Design Flow =	3.0	3.0	
Peak Factor: Peak Design Flow =	6.7	5.0	
Self-Cleansing Design Flow (ADWF) =	540.0	540.0 l/p/d	
Peak Design Flow (PWWF) =	1206.0	900.0 l/p/d	
Number of People per Dwelling =	3.0	5.0 p	
<b>Commercial/Industrial</b>	Design Flow (l/m <sup>2</sup> /d)	ADWF (l/m <sup>2</sup> /d)	PWWF (l/m <sup>2</sup> /d)
Dry retail (toilets not available to customers)	1.3	2.6	6.5
Dry retail (toilets available to customers) / Office Buildings	4.3	8.6	21.5
Wet retail (food and beverage retail/preparation)	15.0	30	100.5
Industrial: light water use	4.5	22.5	30.2
Industrial: medium water use	6.0	30	40.2
Industrial: heavy water use	11.0	55	73.7
Very heavy water users	Specific Design Required		
Commercial Dry Retail Values =	1.3	2.6	6.5
Commercial Wet Retail Values =	15	30	100.5
Industrial Selected Values =	4.5	22.5	30.2
<b>Other Facility Types</b>	Refer to table, WWCoP pg 33		
Peak Factor: Self-Cleansing Design Flow =	2		
Peak Factor: Peak Design Flow =	5		

Line	Increment Number of Residential/ Rural Dwellings	Increment Number of High Density Dwellings	Increment Commercial/ Industrial Area (m <sup>2</sup> )	Increment Other Facility Type (l/d)	Increment ADWF (l/s)	Increment ADWF (m <sup>3</sup> /day)	Cumulative ADWF (l/s)	Increment PDWF (l/s)	Cumulative PDWF (l/s)	Increment PWWF (l/s)	Cumulative PWWF (l/s)	Household Unit Equivalent
<b>Lower Demand Estimate</b>												
Lots	700				4.4	378	4.4	13.1	13.1	29.3	29.3	700
Retirement Village	222				1.4	120	5.8	4.2	17.3	9.3	38.6	222
Light Industry/Services Activities			25019		1.3	113	7.1	6.5	23.8	8.7	47.3	54
Neighbourhood Centre (Assuming 67% wet retail)			4012		0.7	60	7.8	1.4	25.2	4.7	52.0	9
Neighbourhood Centre (Assuming 33% dry retail)			2000		0.0	3	7.8	0.1	25.3	0.2	52.2	4
						<b>674m<sup>3</sup>/day</b>			<b>2180m<sup>3</sup>/day</b>		<b>4506m<sup>3</sup>/day</b>	
<b>Upper Demand Estimate</b>												
Lots	800				5.0	432	5.0	15.0	15.0	33.5	33.5	800
Retirement Village	222				1.4	120	6.4	4.2	19.2	9.3	42.8	222
Light Industry/Services Activities			25019		1.3	113	7.7	6.5	25.7	8.7	51.5	54
Neighbourhood Centre (Assuming 67% wet retail)			4012		0.7	60	8.4	1.4	27.1	4.7	56.2	9
Neighbourhood Centre (Assuming 33% dry retail)			2000		0.0	3	8.4	0.1	27.1	0.2	56.3	4
						<b>728m<sup>3</sup>/day</b>			<b>2344m<sup>3</sup>/day</b>		<b>4868m<sup>3</sup>/day</b>	

S:\Jobs\2296 - Knight Investments Limited - 162 Clarks Beach Road\calculations\Wastewater\162 Clarks Beach Road WW Flow Calcs\2296-01-wwcapacity-bf-aja-20251029.xlsm\WW Pipe Sizing

**WATER DEMAND CALCULATOR - INDUSTRIAL USAGE**

**WATERCARE CODE OF PRACTICE**

CLIENT: Knight Investments Ltd  
 PROJECT: 162 Clarks Beach Road  
 JOB NO: 2296

DESIGNER: BF  
 CHECKED: AJA  
 DATE: 6/08/2025  
 REV:

NOTE: This spreadsheet calculates peak flow rates using the Watercare Code of Practice

Peak Hour Peak Factor 2.5  
 Peak Day Peak Factor 2

Table 6.1D	Routine Peak Daily Usage (l/m <sup>2</sup> /d)
Light water users, or	4.5
Medium water users	6
Heavy water users, d	11

Assume net area is 80% of gross floor building area

Table 6.1A	Routine Peak Usage (l/day)
Residential	220/person/day
3 person design occ	660

Table 6.1C	Routine Peak Daily Usage (l/m <sup>2</sup> /d)
Dry Retail	1.3
Office Buildings	4.3
Wet Retail	15

Commercial and Industrial Zone	Usage Type	Design Flow (l/m <sup>2</sup> /d)	Design Floor Area (m <sup>2</sup> )	Average Demand (m <sup>3</sup> /d)	Peak Day Demand (m <sup>3</sup> /d)	Peak Hour Demand (L/h)	Lot Area (m <sup>2</sup> )	Assumptions on Usage
Neighbourhood Centre/Medical Centre	Dry Retail	1.3	2000	2.6	5	0.3	17177.0	Based on 33% of site being the dry retail
Neighbourhood Centre/Medical Centre	Wet Retail	15.0	4012	60.2	120	6.3	17177.0	Based on 67% of site being wet retail
Light Industry/Service Activities	Light water users, or up to 2 storeys	4.5	25019	112.6	225	11.7	50037.0	Based on 50% of lot area being building coverage
<b>Subtotal</b>				<b>175</b>	<b>351</b>	<b>18</b>		
Residential Zone	Usage Type	Design Flow (l/person/d)	Total Person	Average Demand (m <sup>3</sup> /d)	Peak Day Demand (m <sup>3</sup> /d)	Peak Hour Demand (L/h)	Units or Lots	Assumptions on Usage
Residential-MHS	3 person design occupancy	220	2343	515.5	1031	53.7	781.0	Based on an average of 3 person per lot
Retirement Village	1.5 person design occupancy	220	333	73.3	146.5	7.63	222.0	Based on an average of 1.5 person per unit
<b>Subtotal</b>				<b>589</b>	<b>1177</b>	<b>61</b>		
<b>Total</b>				<b>764</b>	<b>1528</b>	<b>80</b>		

S:\Jobs\2296 - Knight Investments Limited - 162 Clarks Beach Road\calculations\Water\2296-01-WCALC01v1-WaterDemand-bf-20250910.xlsx\Water Demand Calcs

**DETENTION VOLUMES - CALCULATED AS PER GD01 SECTION B1.7.1.1 and TP108**

This spreadsheet calculates SMAF detention volumes using TP108, assuming  $T_c \leq 10$  minutes

Client: **KNIGHT INVESTMENTS LTD**  
Address: **Orawaahi - Clarks Beach Road**

CivilPlan Ref: **2296**  
Date: **7/10/2025**

**DESIGN HYDROLOGY**

Detention Event	Rainfall $P_{24}$ from TP2013/35 (mm)
SMAF 1	95%ile 32

Initial Abstraction  $I_a$  (mm)  
Curve Number CN  
Storage  $S$  (mm)  
Runoff Depth  $Q_{24}$  (mm)

	Pervious	Impervious
	5	0.0
	74	98
$(1000/CN-10)*25.4=$	89.2	5.2
$(P_{24}-I_a)/(P_{24}-I_a+S)=$	6.3	27.5

Catchment	Predevelopment						Postdevelopment						Total Retention + Detention Volume (m³) =Q24(post)-Q24(pre) Or =Q24(post) if new/redeveloped Impervious area is >50% of site area
	Catchment Area (m²)			Runoff Volume (m³) $V_{24}=Q_{24}*A/1000$			Catchment Area (m²)			Runoff Volume (m³) $V_{24}=Q_{24}*A/1000$			
	Pervious	Impervious*	Total	Pervious	Impervious	Total	Pervious	Impervious	Total	Pervious	Impervious	Total	
Industrial	25000	0	25000	156.8	0.0	156.8	0	25000	25000	0.0	688.5	688.5	531.7
Residential	350	0	350	2.2	0.0	2.2	105	245	350	0.7	6.7	7.4	5.2

\*1 For SMAF mitigation this excludes existing impervious areas that are to be redeveloped. Refer to Unitary Plan E10.3.(2).  
i.e. for design purposes predevelopment impervious area is only considered where it is to remain as it is.

**Rainwater Tanks.**

Catchment	Roof Catchment Area (m²)	Annual Rainfall (mm)	Annual Water Yield (m³)	Daily Demand (m³)	Annual Water Demand*2 (m³)	% Water Provided	Tank Size (Based on 30days storage)	Tank Size including Detention (Based on 30days storage) (m³)
Industrial	25000	1200	30000	112	40880	73%	3360	3892
Industrial - Using excess from Neighbourhood Centre *3	31000	1200	37200	112	40880	91%	3360	3892
Residential	220	1200	264	0.66	240.9	110%	19.8	25

\*2 Note that the demand calculations could be significantly reduced with the addition of water saving efficiency measures (i.e low flow fixtures), roof water re-use for non-potable uses and any greywater reuse for non-potable uses.

\*3 Calculation based on using additional roof space from Neighbourhood centre, however excess bore supply from retirement village/neighbourhood centre may also be utilised.

# **APPENDIX 2**

## Proposed Servicing Plans





**LEGEND**

- EXISTING
  - WASTEWATER (GIS SOURCED)
  - WATER (GIS SOURCED)
- PROPOSED
  - WASTEWATER RISING MAIN
  - WASTEWATER PUMP STATION
  - WATER SUPPLY OPTION B
  - WATER SUPPLY OPTION C

EXISTING WATERCARE CLARKS BEACH WATER PUMP STATION

EXISTING WATERCARE CLARKS BEACH WASTEWATER TREATMENT PLANT

PROPOSED WASTEWATER RISING MAIN LENGTH: 3.73KM

WATER SUPPLY OPTION B CONNECT FROM CLARKS BEACH WATER PUMPSTATION PIPELINE LENGTH: 2.61KM

WATER SUPPLY OPTION A CONNECT TO EXISTING 250PE WATER MAIN ON CLARKS BEACH ROAD

WATER SUPPLY OPTION C UPGRADE OR NEW WATER SUPPLY PIPELINE FROM KINGSEAT ROAD PIPELINE LENGTH: 8.0KM

ORAWAAHI DEVELOPMENT

PROPOSED WASTEWATER RISING MAIN

PROPOSED WASTEWATER PUMP STATION

**CIVILPLAN CONSULTANTS**

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PROJECT TITLE:  
**KNIGHT INVESTMENTS LIMITED  
 ORAWAAHI  
 CLARKS BEACH**

SHEET TITLE:  
**WATERCARE NETWORK CONNECTIONS  
 WATER AND WASTEWATER**

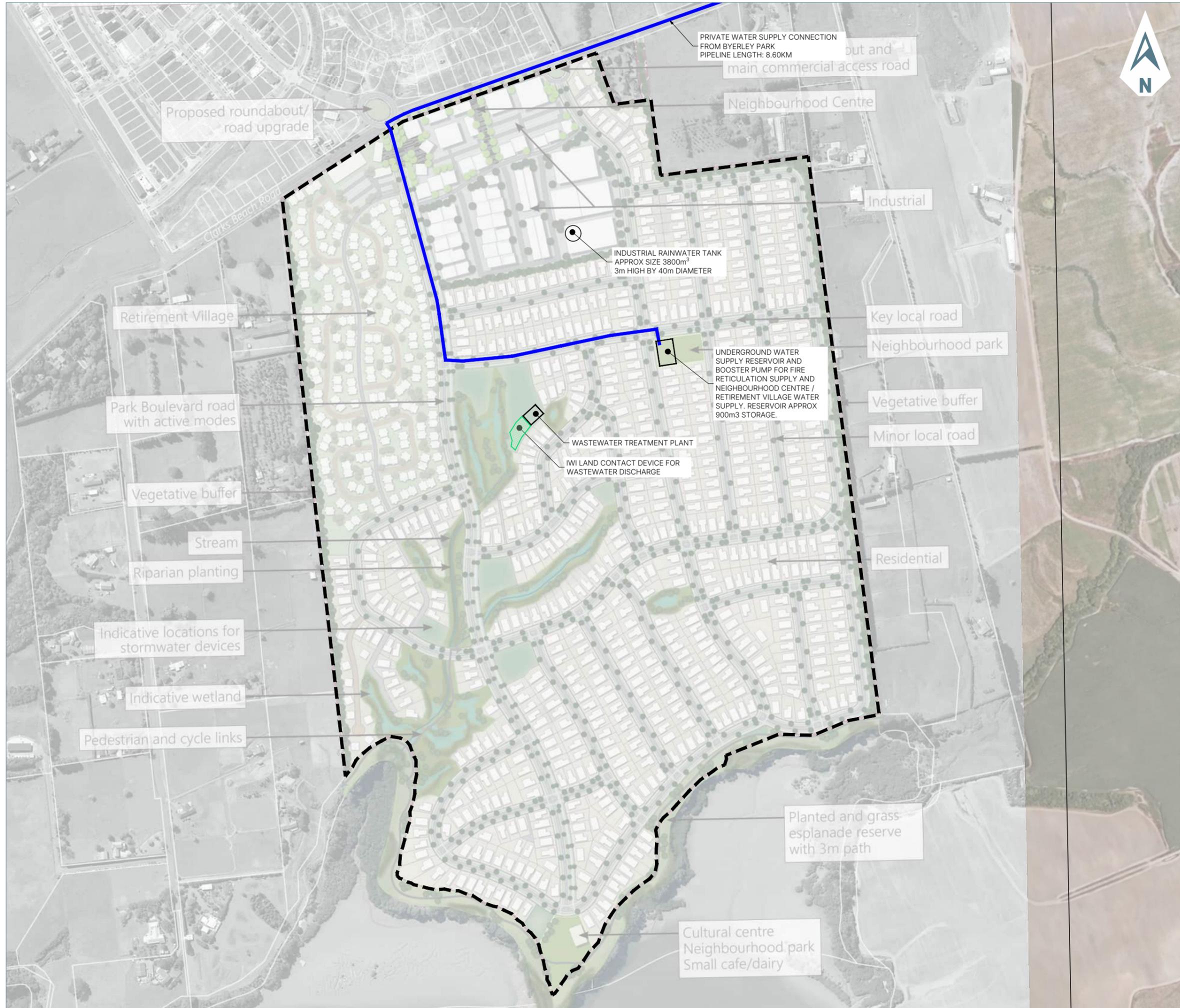
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ISSUE STATUS: **INFORMATION**

PROJECT NUMBER: **2296-01** DRAWING NUMBER: **SK11-1** REV: **-**

REVISION DATE: **16.09.2025**

INFORMATION  
 DRAWN: **KN** CHECKED: **AJA** APPROVED: **RJP**



**LEGEND**  
 PROPOSED  
 PRIVATE WATER SUPPLY LINE

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PROJECT TITLE:  
**KNIGHT INVESTMENTS LIMITED  
 ORAWAHI  
 CLARKS BEACH**

SHEET TITLE:  
**PRIVATE WATER AND WASTEWATER  
 SERVICING OPTIONS**

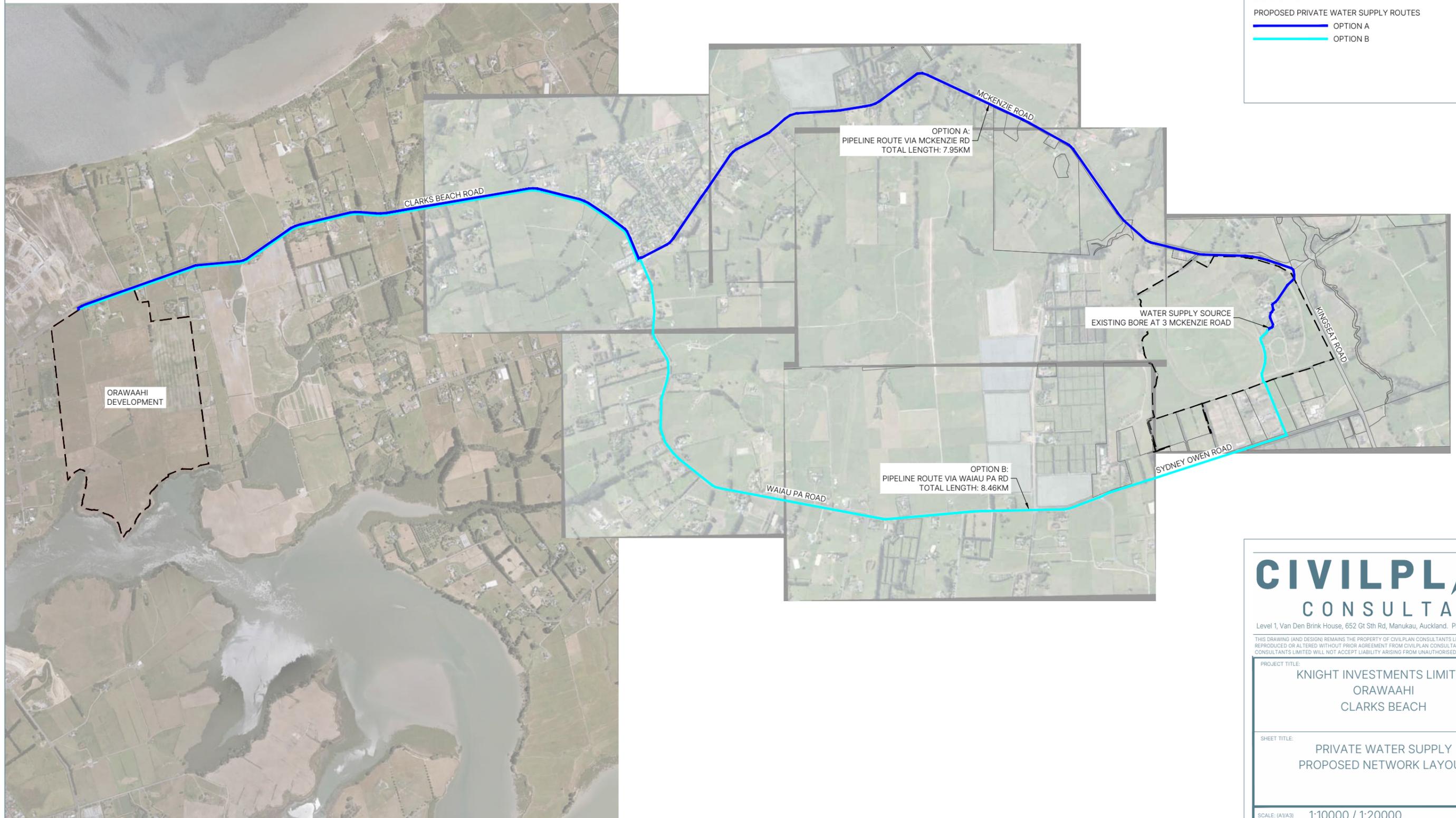
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ISSUE STATUS: INFORMATION		
PROJECT NUMBER: 2296-01	DRAWING NUMBER: SK12-1	REV: -
REVISION DATE: 07.10.2025		REVISION DATE: 07.10.2025
DRAWN: KN	CHECKED: AJA	APPROVED: RJP



**LEGEND**

- PROPOSED PRIVATE WATER SUPPLY ROUTES
- OPTION A
  - OPTION B



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PROJECT TITLE:  
**KNIGHT INVESTMENTS LIMITED  
 ORAWAAHI  
 CLARKS BEACH**

SHEET TITLE:  
**PRIVATE WATER SUPPLY  
 PROPOSED NETWORK LAYOUT**

SCALE: (A1/A3) 1:10000 / 1:20000  
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ISSUE STATUS: INFORMATION			
PROJECT NUMBER:	2296-01	DRAWING NUMBER:	SK10-1
REVISION DATE:	16.09.2025	REV:	-
DRAWN:	KN	CHECKED:	AJA
APPROVED:	RJP		